AMENDMENTS TO THE SPECIFICATION

Please replace the second full paragraph on page 4 with the following paragraph.

In a further aspect, the microfluidic device further comprises a sensor chamber for containing a sensor for detecting an analyte or a condition. In one aspect, the sensor is a cell-based biosensor and the sensor chamber is configured to receive one or more cells. In another aspect, the microfluidic device comprises at least one electrical element **(10)** for performing planar patch clamp analysis.

Replace the paragraph bridging pages 6 and 7 with the following paragraph.

FIGS. 2A-C show top views of different embodiments of microfluidic chips according to aspects of the invention illustrating exemplary placements of reservoirs **(4)** for interfacing with 96-well plates. FIG. 2A shows a chip comprising ligand reservoirs (e.g., the reservoirs receive samples of ligands from a 96-well plate). FIG. 2B shows a chip comprising alternating or interdigitating ligand and buffer reservoirs (e.g., every other reservoir receives samples of ligands from one 96-well plate, while the remaining reservoirs receive samples of buffer from another 96-well plate). As shown in FIG. 2C, additional reservoirs can be placed on chip for the storage and transfer of cells or other samples of interest.

Please replace the first full paragraph on page 7 with the following paragraph.

FIGS. 3A-C comprise a top view of a microfluidic chip structure for HTS of drugs according to one aspect of the invention, for scanning a sensor such as a patch-clamped cell or cells across interdigitated ligand and buffer streams. FIG. 3A depicts the overall chip structure for both a 2D and 3D microfluidic system. FIG. 3B shows an enlarged view of the reservoirs of the chip and their individual connecting channels. FIG. 3C shows an enlarged view of interdigitating microchannel whose outlets intersect with the sensor chamber **(3)** of the chip.

Please replace the third full paragraph on page 7 with the following paragraph.

FIGS. 5A-C comprise a top view of a microfluidic chip structure for HTS of drugs according to one aspect of the invention, for scanning a sensor **(8)** such as a patch-clamped cell or cells across interdigitated ligand and buffer streams. FIG. 5A depicts the overall chip structure for both a 2D and

3D microfluidic system. FIG. 5B shows an enlarged view of the reservoirs of the chip and their individual connecting channels. FIG. 5C shows an enlarged view of interdigitating microchannel whose outlets intersect with the sensor chamber of the chip.

Please replace the paragraph bridging pages 7 and 8 with the following paragraph.

FIGS. 6A -N are schematics showing chip designs for carrying out cell scanning across ligand streams using buffer superfusion to provide a periodically resensitized sensor. FIG. 6A is a perspective view of the overall chip design and microfluidic system. FIGS. 6B-G show enlarged views of the outlets of microchannels and their positions with respect to a superfusion capillary and a patch clamp pipette, as well as a procedure for carrying out cell superfusion while scanning a patch-clamped cell across different fluid streams. "P" indicates a source of pressure on fluid in a microchannel or capillary. Bold arrows indicate direction of movement. FIGS. 6H-6N show a different embodiment for superfusing cells. As shown in the perspective view in FIG. 6H, instead of providing capillaries for delivering buffer, a number of small microchannels placed at each of the outlets of the ligand delivery channels **(5)** are used for buffer delivery. As a patch-clamped cell is moved to a ligand channel and the system detects a response, a pulse of buffer can be delivered via the small microchannels onto the cell for superfusion. The advantage to using this system is that the exposure time of the patch-clamped cell to a ligand can be precisely controlled by varying the delay time between signal detection and buffer superfusion. FIG. 6I is a cross-section through the side of a microfluidic system used in this way showing proximity of a patch-clamped cell to both ligand and buffer outlets. FIG. 6J is a cross section, front view of the system, showing flow of buffer streams. FIG. 6K is a cross-section through a top view of the device showing flow of ligand streams and placement of the buffer microchannels. FIGS. 6L-7M show use of pressure applied to a ligand and/or buffer channel to expose a patch clamped cell to ligand and then buffer.

Please replace the second full paragraph on page 13 with the following paragraph.

In one aspect, the system provides a substrate comprising a plurality of microchannels fabricated thereon whose outlets intersect with, or feed into, a sensor chamber comprising one or more sensors. The system further comprises a scanning mechanism **(9)** for programmably altering the position of the microchannels relative to the one or more sensors and a detector for monitoring

the response of the sensor to exposure to solutions from the different channels. In a preferred aspect, the sensor chamber comprises a cell-based biosensor in electrical communication with an electrode and the detector detects changes in electrical properties of the cell-based biosensor.

Please replace the last full paragraph of page 14 with the following paragraph.

Each microchannel comprises at least one inlet (e.g., for receiving a sample or a buffer). Preferably, the inlets receive solution from reservoirs (e.g., shown as circles in FIGS. 2A and B) that conform in geometry and placement on the substrate to the geometry and placement of wells **(6)** in an industry-standard microtiter plate **(7)**. The substrate is a removable component of the system and therefore, in one aspect, the invention provides kits comprising one or more substrates for use in the system, providing a user with the option of choosing among different channel geometries.

Please replace the third full paragraph on page 37 with the following paragraph.

In one aspect, a suitable tape for interfacing a macroscale component to a microscale component comprises a backing **(11)** coated at least partially on both sides, a first side **(1)** and a second side **(2)** with an adhesive. The backing may be a nonwoven paper, polymeric film (e.g., polypropylene (e.g., biaxially oriented polypropylene (BOPP)), polyethylene, polyurea, or polyester (e.g., polyethylene terephthalate (PET)). Generally, the composition of the backing is non-limiting; however backings are preferably less than about 100 μm thick, more preferably, less than about 50 μm, or less than about 10 μm thick.